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Prevalence and impact of bumps, bruises, and other painful incidents among children while
handling and riding horses

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ABSTRACT

Abstract: Background: Horseback riding and related activities bring risks for serious injury. Extant literature focuses largely on moderate to severe horse-related injuries resulting in a need for medical care. Yet incidents deemed as less severe are also important, with potential to impact subsequent safety precautions and behaviors of parents and children. The study objectives were to gather preliminary information about: (1) the prevalence of a range of horse-related painful incidents experienced by children, (2) children's helmet use and supervision, and (3) the subsequent impact of horse-related painful incidents. **Methods:** One hundred and twenty four child (120 Female; M_{age} : 11.82 years; $range_{age}$: 8 - 18; SD_{age} : 2.26) and parent (103 mothers; 16 fathers; 5 other legal guardians) dyads completed a brief five minute researcher-generated questionnaire. **Results/Conclusions:** Painful incidents are common for children when handling and riding horses, with the majority of children having experienced these incidents more than once. Helmet use and supervision (typically by parents and coaches) were reported to occur consistently during riding, but less commonly during handling (e.g., grooming). Despite the high prevalence of painful incidents, these incidents largely do not impact children's ability to participate in other activities, result in access to specialized medical attention, or alter children's perceptions or behavior around horses. Findings may have implications for safety and education initiatives.

Management Implications: Findings from this work suggest several implications. First, in acknowledging the range and frequency of incidents that occur during horse-related activities, educational initiatives should target a broad range of incident types when teaching about horse safety and injury prevention. Second, in recognizing primary caregivers and riding coaches as the most common supervisors of horse-related activities, they should also be targeted in educational initiatives (e.g., horse and safety knowledge, first aid, supervision guidelines). Finally, in

developing and implementing targeted safety and injury prevention initiatives, reported benefits of the sport (e.g., improved problem-solving skills) could be used and supported in safety programming.

Keywords: pain; equestrian; children; injury; horseback riding

1. Introduction

Similar to other adventure and nature-based recreation (e.g., mountain-biking, kayaking, rock climbing, hiking, lake swimming; Haegeli & Probstl-Haider, 2016), horseback riding and related activities are popular. Despite this popularity, horse-related activities also present significant risks for injury during both handling and riding (Cuenca et al., 2009; Havlik, 2010; Thomas, Annet, Gilchrist, & Bixby-Hammet, 2006; Zuckerman et al., 2015). Examples include risks of being kicked, bitten, or falling off (Newton & Nielson, 2005; Kiss et al., 2008; Vanarthos & Johnson, 1995). Serious injuries from horseback riding have been estimated to occur at a rate of one per 350 to one per 1000 hours of riding (Sorli, 2000). Further, data from hospital admissions suggest that horseback riding is a medium to high impact sport, more dangerous than motorcycling and skiing (Sorli, 2000). It is therefore not surprising that horse-related injuries have been described in recent literature as public health ‘concerns’ or ‘burdens’ (Thomas et al., 2006; Zuckerman et al., 2015).

Recent work has begun to explore a broader range of injury severities as well as common causes of these injuries (e.g., horse spooking, ill-mannered horses, other humans; Camargo et al., 2018; Gombeski et al., 2017). Throughout this paper, injury will be defined as any bodily harm, hurt or damage resulting from an interaction between a person’s behavior and their environment (Haddon & Baker, 1981). Learning more about the preventability of these injuries is also a growing area, with one study suggesting at least 60% of injuries may have been preventable (Camargo et al, 2018). Sufficient knowledge about the risks, participants and injuries that occur in a given activity are critical to developing injury prevention initiatives (Haegeli & Probstl-Haider, 2016).

Literature specifically related to children and horse-related injuries has been more limited despite their heightened level of risk. For example, one review suggested that horse-related injury rates in children are twice that of adults (Jagodinski & DeMuri, 2005). Another study indicated

mortality rates as high as 2.5% for children with horse-related injuries who were admitted to hospital (Ghosh, DiScala, Drew, Lessen, & Feins, 2000). To date, the focus in child-specific horse-related injuries has been on those requiring emergency room visits and hospital admissions. It is important to acknowledge, however, that in line with Haddon and Baker's (1981) definition of injury, some injuries may only result in hurt (and therefore not require medical attention). Throughout the remainder of this paper, the term 'injury' will be used to broadly refer to injuries as per the definition by Haddon and Baker (1981), while the term 'painful incidents' will be used to refer specifically to injuries that result in hurt or pain but may not necessarily result in bodily harm or damage. In these cases, one's subjective experience with painful incidents would be particularly important¹, and influence whether or not one will present to a medical setting. Existing, child-specific literature has yet to explore (a) painful incidents during horse-related activities, (b) safety precautions in place at the time of these injuries, and (c) the subsequent impact of these injuries (e.g., perceptions towards horse-related activities).

The aim of the present descriptive study was to improve our understanding of risks and safety-based interventions; this is well aligned with the broad goal of recreation-based risk literature. Specifically, this study addressed two topics related to personal risk in recreation: personal risk taking (e.g., understanding factors that might contribute to risks) and managing risks or risk perceptions (Haegeli & Probstl-Haider, 2016). Gaps in existing literature described above were explored through children's and parents' self-report of: (1) the prevalence of painful incidents incurred among children while handling and/or riding horses, (2) children's helmet use and level

¹ Pain, as defined by the International Association for the Study of Pain, is "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage" (IASP; 2012, Pain terms, para. 1). Pain is a subjective phenomenon, meaning that the self-report of a given person is critical in understanding their experience of the event.

of supervision when working with horses, and (3) the subsequent impact of these incidents². The consistency of parent and child reports associated with helmet use and level of supervision was also assessed to understand similarities and differences in parent and child report of safety behaviors. Given the descriptive nature of these objectives, specific hypotheses were not generated.

2. Methods

This study received approval by the XX's Research Ethics Board (date: October 30, 2015; #15SE033).

2.1. Participant Recruitment

Participants were recruited on two weekends at the XX Equine Activity Centre in 2015 at the XX in XX. The XX is the largest indoor agricultural fair and international horse competition in the world, with over 300,000 attendees each year, many of whom are involved in the horse industry. Children between ages 8 and 18 participating in horseback riding at least once per week were eligible to participate. Parents/legal guardians needed to have a child who met the aforementioned criteria. Proficiency in English was also a requirement. One hundred and seventy children and 136 parents/guardians completed questionnaires; 124 participants had complete data from parent-child dyads and were utilized in the present analyses. If two parents provided responses for an included child ($n = 4$ children), only the mother's reports were retained for analyses given that the majority of participating parents in dyads were mothers (82.5%).

2.2. Participants

² i.e., was medical attention sought, was there an impact on children's ability to participate in other activities, what are children and parents' perceptions of the sport: do their views change after painful incidents; do they see benefits of the sport despite the risks

Participants in the current study were 124 child (based on child report: 120 Female; M_{age} : 11.82 years; $range_{age}$: 8 - 18; SD_{age} : 2.26) and parent (based on parent report: 103 mothers; 16 fathers; 5 other legal guardians) dyads. Most children ($n = 113$, 91.1%) were between age nine and fifteen; four children were eight years old (3.2%), and seven were between ages sixteen and eighteen (5.6%). Nearly all children took riding lessons ($n = 119$; 96%), and approximately half either owned or leased a horse (own: $n = 49$; 39.5%; lease: $n = 27$; 22.3%). Mean number of years riding was 4.39 ($range = 0.08 - 14.00$ years; $SD = 3.12$). See Figure 1 for additional information about child involvement with horses.

2.3. Materials

A researcher-generated questionnaire (available online as a supplementary material) was designed to gather demographic information about the child and their riding habits including number of lessons per week and length of time riding. There were no suitable pre-existing questionnaires. Questions were developed based on previous findings in the literature (e.g., common types of horse-related incidents), researcher experience, and collaboration with the director of XX, a world-renowned centre at the XX which serves the horse industry via healthcare promotion, education, research, and industry development. See Table 1 for further information about the questionnaire.

2.4. Procedures

Children and at least one parent/legal guardian each provided verbal assent/consent and completed the questionnaire. Children under the age of 12 completed the questionnaire with a trained research assistant; children ≥ 13 years and adults had the option to complete with a research assistant or ask clarification questions as needed. All children who participated in the study received treats for their horses as a thank you.

2.5. Analytic Approach

2.5.1. Quantitative Analyses. Most data from the questionnaire were analyzed using frequency and descriptive analyses (e.g., mean, standard deviation, percentages). Participants missing data for a given question/item were excluded from the corresponding analysis. Agreement between parent and child reports of helmet use and supervision were compared using percent agreement and Cohen's Kappa.

2.5.2. Qualitative Analyses. *Development of Codes:* Following recommended steps by Elo and Kyngas (2008), a rigorous content analysis via unconstrained matrix was used to develop a coding scheme for one question (What is the best thing about horseback riding?). In this scheme, both inductive (e.g., consideration of participant responses) and deductive (e.g., consideration of benefits of horseback riding documented in extant research literature) approaches were incorporated. After familiarization with the data and literature, categories were generated and grouped into broader defined categories (Elo & Kyngas, 2008). These schemes were reviewed and refined by other researchers on the team (e.g., editing category definitions, examples for each category; Elo & Kyngas, 2008). The coding scheme is available from the corresponding author upon request.

Training and Reliability for Coding of Questionnaire Responses: Research assistants received training on the completed coding schemes to a minimum of substantial Kappa agreement (Landis & Koch, 1977) across a series of independent practice sessions using fictitious researcher-generated responses. All data were independently double coded by two research assistants using the binary present/absent coding scheme and reliability calculated using Cohen's Kappa and percent agreement. Coding discrepancies were resolved by the primary investigator. Notably, there was a difference between the range of Kappa and percent agreement

values such that while percent agreement was consistently high, some Cohen's Kappa values were low. This discrepancy is likely due to the substantial imbalance noted in the crosstab tables used to calculate Cohen's Kappa. This imbalance can lead to paradoxes such as these in binary coding (Feinstein & Cicchetti, 1990).

3. Results

3.1. Prevalence of Painful Incidents around Horses

Participants reported that children experienced a wide range of painful incidents when handling and riding horses (see Figure 2). More than 40% of participating children reported having experienced six out of the ten painful incidents listed on the questionnaire at least once, with the exceptions of being kicked (25%), trampled (12.1%), dragged/run over (13%), and stable-related incidents (e.g., pinching hand in stall door; 38.7%). Approximately 75% of children endorsed having experienced at least one type of painful incident multiple times.

3.2. Children's Helmet Use and Level of Supervision around Horses

Across riding activities, the mean percentage of children reporting consistent helmet use and supervision was 99.2% and 82.2% respectively. In comparison, when handling horses, children reported consistent helmet use and supervision 16.9% and 45.1% of the time, respectively (see Table 2). Parent reports showed a similar pattern. Parent-child agreement was perfect for helmet use when riding. In contrast, parents reported that their children had higher helmet use when handling horses and higher levels of supervision during both riding and handling than the levels reported by their children. Riding coaches and parents were indicated as the most common primary supervisors when riding and handling horses (see Table 3).

3.3. Impact of Painful Incidents

Parent and child reports from this study's sample suggested that medical attention was not typically sought for the painful incidents reported; however, a minority of participants did report seeking additional medical and/or emergency medical attention (see Table 4). Both parents and children indicated in most cases children received help for painful incidents from their parents and riding coaches. The vast majority of children (91.9%) and parents (90.2%) denied that these painful incidents prevented them from engaging in other activities such as playing other sports or attending school. Further, the majority of children ($n = 85$; 69.7%) and parents ($n = 87$; 72.5%) indicated that these painful incidents did not impact how they behave around horses. Of the children who reported a change in their behavior ($n = 37$; 30.3%), 17.1% indicated that they may act more careful/cautious/aware around the horses, 4.1% reported feeling more nervous/shy around the horses, and 7.3% indicated that they have modified their behavior in a way specific to the painful event (e.g., keep hand away from horse's mouth if they were previously bitten). Two child participants (1.6%) provided responses which were unclear and could not be coded into a specific category of behavioral change. Similar to child participants, of the parents who reported a change in their own behavior ($n = 33$; 27.5%), 16% indicated that they may act more careful/cautious/aware around the horses, 5% reported feeling more nervous/shy around the horses, and 3.4% indicated that they have modified their behavior in a way specific to the painful event. Responses from 1 parent referred to their children instead of themselves (0.8%), and three responses (2.5%) were unclear (Cohen's Kappa: 0.93; almost perfect agreement).

The majority of parents (90.8%) and children (95.1%) reported that these painful incidents did not impact how they feel about horses or equestrian sport. Both parents and children reported a number of different benefits, or 'best parts' of equestrian sports (see Table 5).

Most commonly, children viewed the relationship with the horse as most beneficial (51.6%), while parents endorsed aspects of personal development (55.8%).

4. Discussion

Horseback riding is a common recreational and competitive sport, and horse-related injuries have long been considered a public health concern (Thomas et al., 2006). Indeed, horseback riding has been deemed more dangerous than motorcycling and skiing (Sorli, 2000). While most research has investigated horse-related injuries in the context of emergency medical settings and hospital admissions, it is also important to understand painful incidents that do not necessarily lead to these medically based outcomes. Initial work in this area has been conducted by Camargo et al (2018) and Gombeski et al (2017) focusing on understanding a broad range of injuries and their causes as well as the preventability of these injuries in a sample of riders across the lifespan. Our objectives were to: a) gain a better understanding of the prevalence of painful incidents experienced when handling and riding horses, b) contextual factors of helmet use and supervision, and c) the impact of these incidents on medical attention sought, behavior, and perceptions of the sport. These objectives were addressed in a child-specific sample.

4.1 Understanding the Prevalence of Painful Incidents. Our results suggest that painful incidents while riding and handling horses are quite common; these include being stepped on and falling off. These findings are consistent with those from Camargo et al. (2018) suggesting that painful incidents (and potential for injury) have many causes, can range in severity, and occur most often when mounted. Personal decisions about risk may impact uptake of preventative measures and these concerns have also been highlighted in broader works related to personal risk and decision making (e.g., Jones & Yamamoto, 2016). Therefore, it may be more difficult to convince riders to take safety precautions while on the ground if they perceive risk to occur mainly while

mounted; this should be considered when developing safety initiatives. Of note, a small subset of participants from this study also reported having sought emergency medical attention for these painful incidents; however, we are unable to confirm the true injury severity of these occasions, and whether or not their visits to emergency medical services were necessary. It is critical to seek medical attention if there is any question regarding the severity of an injury that has occurred so appropriate action can be taken.

With respect to safety practices, the majority of participants reported consistent use of helmets during riding activities. However, helmets were used much less often when handling horses (28.2% of parents and 16.9% of children reported ‘always’) compared to riding horses (99.2% of parents and children reported “always”). As injuries including painful incidents also occur when handling horses, the use of safety equipment at these times is critical (Cuenca et al., 2009; Ghosh et al., 2000; Gombeski et al., 2017). Even though the importance of and need for safety promotion in equestrian sport has been emphasized (Sorli, 2000) and initiatives have been implemented (e.g., policy, educational activities), these results suggest there is still more work to be done.

4.2 Understanding Helmet Use and Supervision. Parents and coaches were reported as frequent supervisors for children during horse-related activities. Importantly, people who supervise children around horses may have varying levels of knowledge, exposure, and comfort around horses, all of which could impact their ability to effectively supervise children and make appropriate judgments when incidents occur. Further, similar to other activities in risk literature (e.g., bike riding; De Rome et al., 2014), it is possible that supervisors could be a contributing factor in all types of horse-related injuries (Gombeski et al., 2017). Implementation of safety initiatives targeting parents and others who are supervising children’s horse-related activities may

help to ensure they have adequate knowledge about horse behavior, safe handling and riding practices (Thomas et al., 2006).

In addition to playing a supervisory role, parents and riding coaches were understandably relied upon to make care-related decisions following painful incidents. Thus, consistent with previous literature, first aid knowledge of these supervisors appears crucial to the provision of appropriate care and accurate estimation of injury severity (Ghosh et al., 2000). For example, it is important for riders, coaches, and parents to have access to education about concussions and head trauma (Kuhl, Ritchie, Taveira-Dick, Hoefling, & Russo, 2014). Requirements for minimal levels of education for riders, caregivers, and coaches may contribute to improved risk management in riding stables and horse-related businesses.

4.3 The Impact of Painful Incidents. Children did not perceive painful incidents reported in this study as impacting their engagement in other activities such as sports or school attendance. Thus, while these incidents occur often, they do not seem result in significant functional impairment. Furthermore, the majority of children reported no impact on their actions around or opinions about horses. Many of these incidents may be preventable (Camargo, 2018; Gombeski et al., 2017; Loder, 2008); thus, the lack of behavioral change is concerning and requires further investigation. For example, do children recognize their role in these incidents, or do they view these as something which cannot be prevented (i.e., viewed as "accidents" rather than unintentional injuries)? Furthermore, of those who indicated a change in behavior, some reported becoming more careful and nervous around horses. It is important to explore the manifestation of this response, as overly cautious behavior or nervousness could conceivably increase the risk for another painful incident, or potentially a more serious injury. For example, horses may respond negatively to subtle emotional changes in humans (Vidrine, Owen-Smith, & Faulkner, 2002). In

this way, a nervous rider could lead to a nervous horse who is more likely to refuse a jump or spook at a noise in the environment.

Of note, it is important to highlight that despite the risks associated with horse-related activities, participants also endorsed a range of benefits associated with the activity. These included the relationship they develop with their horse and development of personal qualities such as leadership or problem solving. Benefits like these may have positive implications for safety initiatives and practices. For example, leadership opportunities could be provided for children to encourage peer use of helmets. Additionally, an educational initiative could include revisiting painful incidents and helping children to problem solve how an incident may be prevented.

4.4 Strengths, Limitations, and Future Directions. This work is one of few studies (e.g., Camargo et al., 2018) to explore a broad range of injuries that can occur when engaging in horse-related activities. To our knowledge, ours is the only child-specific study. Our focus was on the prevalence and impact of painful incidents not (perceived as) requiring emergency medical attention. This is in contrast to previous work which has investigated injuries resulting in medical intervention, which represents only one end of the injury spectrum. Our recruitment and data collection allowed parents and youth with first hand experiences of a range of painful incidents to provide insight which may not otherwise be available. Given the subjective nature of pain and the less severe nature of these events, self-report is critical to understanding participants experiences. The ability to compare between parent and child ratings also allowed for some understanding of the reliability of children's self-reports. Careful development of a brief questionnaire through the use of extant research literature, personal experience, and expert opinion also helped to ensure that appropriate questions were posed. The use of forced multiple-choice and open ended questions allowed participants to provide self-generated information and

build on their responses when relevant. Rigorous use of qualitative content analytic approaches as per guidelines by Elo and Kyngas (2008) also boosts the validity and reliability of results.

This study also has several limitations. First, this was a convenience sample and as such may not accurately represent the larger population of youth who ride horses. Inclusion criteria also required youth to be actively riding at the time of study participation. Those participating in the study were clearly continuing to ride horses despite the occurrence of painful incidents, and may therefore differ from those who stopped riding after a painful incident. Second, for feasibility, the survey was designed to be very brief (completion time < 5 minutes) which placed limits on the depth of the data. This questionnaire was also not tested for validity prior to use other than review by an expert in the field for face validity. Third, a primary objective was to gather parent and child perceptions of the prevalence of a range of painful incidents; however, this was measured retrospectively and via self-report, so it is possible that the number of incidents is under or over-represented in this study. This may be particularly the case for the younger children (e.g., those ranging from age eight to ten) in the sample. Nevertheless, self-report is critical for understanding one's subjective experiences of pain and perceived impact of the experiences. Further, the degree of consistency between parent and child reports may provide more confidence in the reliability of the findings. Future prospective work using online or phone data entry as children and youth experience incidents in 'real time' is an important next step. Taking a longitudinal approach and following children throughout their riding career would allow for more complex analyses regarding risk. Future research could also focus on gaining an in depth understanding of safety considerations to help prevent or lessen the severity of injury. This information could help to inform equestrian safety practices as well as injury prevention initiatives for the equestrian community.

5. Conclusions

These results add to previous literature on serious injuries and suggest that less severe painful incidents when handling (e.g., being stepped on) and riding horses (e.g., falling off) are also common for children. Findings are consistent with other early work investigating the range of horse-related incidents and injuries (Camargo et al., 2018). Helmet use and supervision are used most commonly when children are riding horses but are not nearly as common when handling horses. The impact of these incidents on active horseback riders appears to be minimal with respect to reports of children's behavior around horses and perceptions of the sport. However, this information could inform areas of need in the development of safety and educational programming for young equestrians. Benefits of the sport as reported by parents and children may also be utilized and supported further in the creation of programming, such as developing problem-solving skills for engaging in safety behaviors. Further work is warranted to gain a more precise picture of painful incidents among children participating in horse-related activities, and to develop and implement targeted interventions.

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